

CRM TRAINING IN THE 349TH MILITARY AIRLIFT WING

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INTRODUCTION

MAJ. HALLIDAY: Our group is made up of Reservists. We are part-time employees of the Air Force. We are the classic cases of the "citizen soldier." I am a pilot for Air California, my partner, Maj. Tony Inzana, is a pilot for Western Airlines, and Lt. Col. Biegalski is a civilian with the federal government. Our Commander, Lt. Col. Bill Jenkins, is a United Airlines pilot and is here with us. Our group has been working in this area for about two years and running seminars for over a year. My own background includes work for United Airlines Services Corporation on their successful bid for the C-5 Aircrew Training System contract.

We have created our program on our own time, on airline trips, or during evenings at home. We built our program on little or no funding. Maj. Inzana personally financed the printing of our CRM questionnaire. CRM training *can* be done on a limited budget.

I want to take a moment to describe a C-5 crew. We are faced with a unique physical plant. We have crewmembers scattered all over an airplane that is the size of a B-747. The minimum crew size is seven, but can grow to a maximum of 22. We have a mix of officers and enlisted crewmembers. They talk by headset and interphone, rather than by simple face-to-face communication.

It seems that everyone has a special name for their CRM program. We have created a new program and selected the title, "Aircrew Resource Management" (ARM) to emphasize the use of the full resources on our aircraft. That is meant to specifically include our loadmasters. The name also emphasizes the concept that *all* crewmembers are responsible for safe completion of the trip. Our loadmasters have been our brightest students to date. We feel they are a classic under-utilized resource. Together, their crew position has been credited with more ARM "saves" than the engineers and pilots.

We have a seminar-based program run by two seminar facilitators that is reinforced by LOFT sessions run by our active-duty counterparts. A complete program would be impossible without their help. We are selecting our seminar facilitators very carefully. Not everyone has the skills needed to serve in this capacity.

We have planned for three phases in the program and are 75% complete through Phase I. The Phase I seminar is made up of a typical ten-member C-5 crew--three pilots, three flight engineers, and four loadmasters. It is a nine-hour training day with

no breaks. Fatigue is part of the course design. It is designed around group interaction and team drills as opposed to a workbook approach. It is also time-intensive. Most of the exercises have a time limit.

We emphasize three main learning objectives: 1) synergy, the concept; 2) the synergy graph--a common language (much of this based upon the work of Dr. Bob Helmreich); 3) the synergy formula--the heart of our program. These three concepts are quickly backed up by case studies and practical exercises to use these new tools to analyze crew behavior and to practice the new ARM skills. The goal of the seminar is to give crews something *practical* to take to the airplane, and this practical information is what the synergy formula is about. We have achieved this, and feel strongly that the seminar *presentation* of the *learning objectives* and *ARM tools packaging* are critical. They must be something the student is comfortable with. These points are as critical as the ARM concepts themselves. For example, we have judiciously inserted conflict into several seminar segments. Carefully managed, conflict is the energy that electrifies the seminar, the role-plays, and the *learning* experience.

We feel that we have several strengths in ARM training, and we have some new concepts under development. Our first strength is the synergy formula. It is the centerpiece of our program and is simple. Another strength is our use of videotape and replay of role-plays. This offers a chance to practice and evaluate the groups' use of new ARM skills. We are forcing LOFT learning objectives identified by our own observations and NASA research down into videotaped role-play. Our objective is to download the LOFT sessions and to provide better personal feedback. This approach has been very successful and opens up the question of the level of required fidelity (of training devices) to train CRM. We are the guys with bathroom plunger that Dr. Helmreich talked about. I'm glad you laughed, our students do too. It is simple, and it's funny, and *it works*. The plunger trains captains to let the copilot fly while he/she manages. The videotape role-play also offers subordinate crew members their first opportunity to observe and analyze the decision-making process.

Another strength is a new team model that we have under development. We also include something we call "Intruder Training"--the insertion of a new crew member into an already formed group. Finally, among other things, we are working on a new role-play design and post-mission critique model.

We have several long-term goals. Among others they are: 1) to seek to induce our crews who fail in CRM to analyze and critique their own work; 2) to incorporate three ARM phases with subsequent phases adding new concepts and reinforcing Phase I skills; 3) to continue basic ARM research with Dr. Bob Helmreich, including research on an active-duty Air Force unit that has not been exposed to any CRM training.

ARM is pervasive in our organization. As examples: 1) ARM is the number one long-term goal of our Commander; 2) we have reorganized our entire unit to promote ARM goals; 3) we will soon be using an ARM attitude inventory to *select-in* the right "new hires"; 4) we have created an ARM staff that reports directly to the Commander; 5) we are using ARM for remediation; 6) our examiners are using Phase I ARM in their corrective action recommendations when they observe poor teamwork; 7) we are creating an ARM critique guide for our check airmen to use on line missions; 8) we will soon be

putting loadmasters into LOFT sessions to promote full teamwork; 9) we have created and are using pilot-coordinated, yet flight engineer-initiated, simulated inflight emergencies for our local training flights, and this really draws the crews together.

Everyone wants to know if CRM works. We feel we are up to about 12 "saves" as the result of our program. As a graphic example, one of our ARM-trained crews recently prevented a repeat of the tragic loss of a 100 million dollar C-5 at Clinton-Sherman Municipal in 1974. Only the copilot, Lt. Col. Jenkins, and the engineer were ARM trained on this recent "save." The brakes had been "capped off" improperly prior to departure by maintenance. Subsequently, the wheel locked during taxi-out. This created a white-hot brake that would have been retracted after takeoff. A serious fire would have ensued. The ARM-trained copilot and engineer voiced their concerns during taxi to the Captain, who was concerned with an on-time takeoff. Their concerns about a locked wheel were initially rebuffed by the Captain. They *persisted*, however, and the Captain stopped to investigate. The "scanner" reported that the brake was "white hot," and the crew and passengers completed a safe emergency evacuation.

Ladies and Gentlemen, we need your help at this workshop. We could use help in developing: 1) a post-mission self-critique model; 2) CRM instructor training; and 3) video support--aircraft crashes, "saves," etc.

One final point--any CRM program is going nowhere without the *open, vocal, visible, support of your organization's leadership*. Our own program has flourished under the leadership of Lt. Col. Jenkins.

I have the pleasure of introducing Lt. Col. "Ski" Biegalski to you. Ski is a civilian Air Reserve Technician in the Civil Service and is a C-5 check airman. He is the Chief of Flight Standards for our Reserve Wing. Ski has worked our program from the start, and is the Wing ARM Program Manager. Ladies and Gentlemen, my partner and good friend, "Ski" Biegalski.

THE SYNERGY FORMULA

LT. COL. BIEGALSKI: I would like to digress, momentarily, from the topic of Cockpit Resource Management or Aircrew Resource Management, and take you back to a time when you owned your first automobile. You were younger then, and your income was substantially lower than it is now. Let's say that your automobile engine had gone kaput. The entire engine is shot, and you don't have the funds to rebuild it. So, what to do? Since you can't afford to pay for someone else to do the job, you'll have to do it yourself, but you don't know how. You have to learn.

A logical move would be to go to your local junior college or vocational school and enroll in a course of instruction on automotive engine theory. Now, though it's true that you need to know about engine theory before you attempt to do the work, after you finish the course and understand how engines work, you still can't rebuild one. So, what's the next step?

You enroll in the next logical course--one specifically dedicated to engine-rebuilding. You finish and finally understand exactly how to rebuild your dead engine, but you are still unable to tear it apart and rebuild it. Why? Because you have no tools and no training in how to use them. So, you finally buy the correct tools and receive appropriate training in their use. And now, you finally have a new *ability* or *skill*, and are finally ready to get out in the driveway, to tear an engine entirely apart, and to rebuild it.

Now, let me return to the subject of this workshop, CRM. The Synergy Formula is our inflight tool, if you will, for problem-solving and decision-making in the cockpit. It enables graduates of our seminar to act/behave better inflight so that the solution they reach will be the result of coordinated group effort instead of the decision of only one person, working from potentially incomplete information.

In our Phase I seminar, we have anywhere from three to four hours of lead-in discussion before we get to the Synergy Formula itself. The formula is the heart of Phase I training. The formal goals of Phase I are twofold: 1) to understand and internalize the formula, and 2) to use it inflight for problem-solving and decision-making.

When does it apply? Whenever group or team-coordinated action is required by the situation. It is my belief that although many problems can be successfully solved by one person, the penalty for incorrect decision-making in an aviation environment is so severe that group problem-solving is almost always the safest solution. A corollary to this theory is that some situations specifically require group problem-solving, in that each person has only a piece of the puzzle and a synergistic solution is required. Without it, unilateral decision-making will almost surely lead to an incomplete and potentially disastrous solution.

Lead-in topics to the formula include motivational information, a discussion of barriers to communication, training in communication skills, and a discussion of behavioral characteristics of individuals in a group problem-solving environment (among other things). This is, in effect, training in a new language which will ultimately enable students to understand, internalize, and apply the Synergy Formula. A side benefit of learning the lead-in material is that students increase their understanding of interactive relationships and increase their communicative skills. It is important to re-emphasize, at this juncture, that our training is quite tool- or skill-oriented. The reason for this is that we are striving to maximize effect in the short time available for training. It is our desire that each crew member literally visualize the formula inflight, as if it were placarded on the instrument panel. Why? Because it is easier to visualize a simple graphic display than it is to remember, consider, and use a list of items.

In our seminar, after teaching and discussing the formula, and prior to initiating role-playing (our method of forcing the internalization process), we hand out three-by-five cards with the formula written on them. We watch as the students actively refer to these cards during role-plays. Final indication that the information is considered valuable is that the students refuse to return the cards. We have little difficulty in recovering any of the other course materials, but the three-by-five cards of the Synergy Formula do not come back--the students take them home.

Figure 1

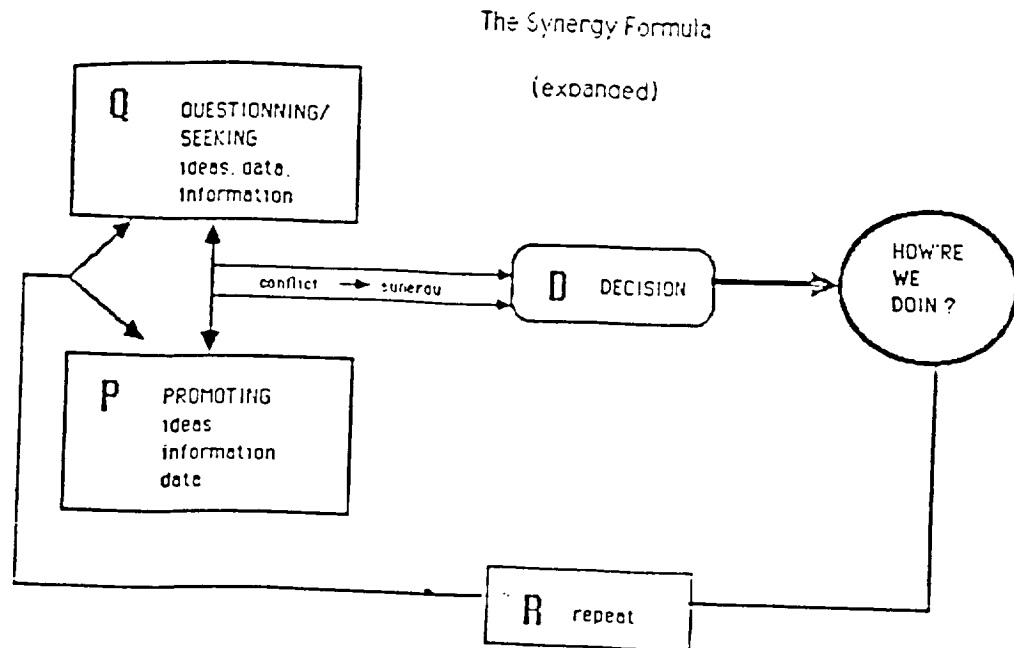


Figure 1 portrays the Synergy Formula. As you can see, the information it contains is not new, although it may be arranged in a somewhat different fashion than you've seen before. There is no real magic about the process of problem-solving and decision-making. Psychology books have contained information on the topic for years. What is new, of course, is the display.

"Q" stands for questioning, seeking, and searching for information, data, and ideas. While this task is not solely the task of the captain or aircraft commander, it is a task which tends to fall primarily on his shoulders. The captain is the person who will ultimately make the decision, and it is quite obviously to his advantage to acquire as much information as possible before making a decision. It must be remembered, however, that not all captains are strong leaders, nor will all captains question effectively. *All* crewmembers have the responsibility for seeing to it that every part of the formula is used.

"P" stands for *promoting*, or advocating the information, data, ideas, needs, requirements, etc., which each member of the crew possesses. Think of this as "placing information on the table" so that the captain can inspect it all at once. An uninformed, or partly-informed, captain can hardly be expected to make an appropriate decision. Crucial to the act of promoting, is the delicate art of polite, but aggressive communications. To initiate communication with a confrontational statement tends to destroy the chances of accurate reception. Excessively timid communication, likewise has little chance of success.

Once all the information is "out on the table" (remembering of, of course, that this metaphorical table is in the mind of the captain/aircraft commander), some of it will tend to be in conflict. Needs and requirements of different sections of the airplane may be dichotomous (we've lost cabin pressure, we have to fly at a higher altitude to make destination, but the passenger with the bad heart will die if we can't keep cabin altitude below 10,000 ft.). Ideas or concepts may be in conflict (so what if the fuel flow gauges are inoperative at both pilot and flight engineer stations . . . we can't safely monitor the engines during takeoff without at least one set of fuel gauges). It is right here that the synergy is developed. In the act of working out the conflicts through a "purification and refinement" of data, the pilot-in-command is able to make a "synergistic decision," one based on more data than was previously available to any single individual on the airplane.

"D" is the decision. Decisions are made by the pilot-in-command. Command authority is statutorily and by regulation assigned to the captain. Command authority may only be removed by removing the pilot-in-command. This is possible in both its physical and figurative sense. Removal from command in flight, however, is a maneuver fraught with danger. Under almost all circumstances, it is the duty of all crewmembers to preserve the authority of command. A flightcrew is not a democratic organization, nor should it be. It is, further, a survivable entity only so long as all decision-making is funneled through the pilot-in-command.

The next step, shown on this slide as "how're we doin?" was one of our biggest stumbling blocks. Getting our guys to *remember* to do an immediate and ongoing inflight review, an assessment of how actions solved (or failed to solve) problems was one of our biggest problems as courseware developers. How did we solve this problem? I need to digress again.

You may have heard of the old airline joke about the company that decided to standardize the names of the cockpit crew positions. To make a long story short, they were trying to avoid the use of first names (Larry, Frank, and John sounded a bit unprofessional, while John, John, and John was downright dangerous). They considered captain, first officer, and second officer, but found this too cumbersome. The management finally settled on the names, "Captain Sir" (for the captain), "Bubba" (for the copilot), and "Hey-Boy" (for the flight engineer). Well, to get back to the Synergy Formula, in our unit we decided not to have any "Hey-Boys." Our airplane flies with the captain in command, and everyone else on the crew gets to be a "Bubba"--captain's little helper. We started calling our immediate inflight review, shown on the slide as "how's it going?" as "Bubba's review," so named because any "Bubba" can call for the review if the captain forgets. All he has to do is wait for that lull in the activity that indicates that the immediate pressure is off and ask for a "Bubba review."

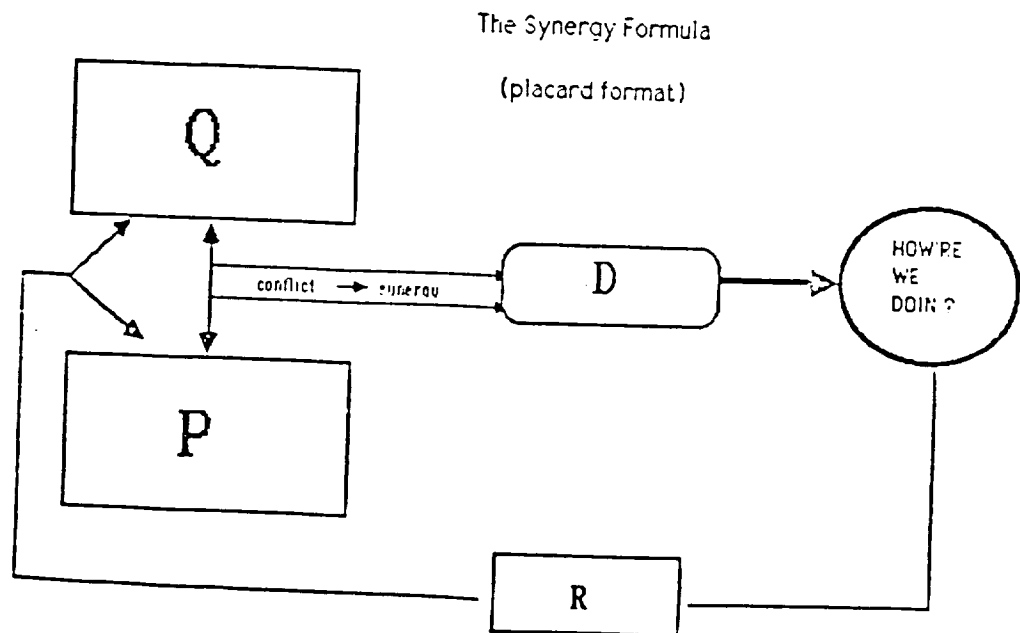
The contents of a "Bubba review" are simple. If the captain has forgotten to inform the crew of his decision, "Bubba" asks, "sir, please announce your decision." The captain must always make his decision clearly known to the flightcrew if he expects to get the right actions in response. Once the decision has been announced, or clarified, the captain asks for a report from all involved crewmembers. He needs to find out how things are going and if he still has problems which need attention. If the optimum solution to all problems has not been achieved, he closes the loop by reinitiating the

Synergy Formula. Repeat this process as many times as necessary.

Why did we insist on using such a dumb name as "Bubba's review?" The answer is simple, the name is so excruciatingly corny that I mentally cringe when I say it, but by the same token, I'll never forget it either. That, of course, is the whole point. *Nobody* can forget it once they've heard it and used it during role-plays. The most important point to be made is that trained crewmembers also remember the "Bubba review" in the cockpit.

Finally, I'll return to the placard theory. This is what we want visualized in the cockpit. If I had control over the airplanes our crews fly, I'd literally placard each panel at each crew station. For the present, we must rely on visualization. That's why it is so important to display and train vital skills in as simplistic and graphic a manner as possible. Most people, particularly crewmembers, resist the use of a memorized list, but can remember a diagram.

Figure 2



Finally, after you've seen an overview of Phase I training, and discussion of the Synergy Formula, the question still remains, does this type of training actually work? Our belief is that it does. Some of our research tells us a very encouraging story about the effectiveness of the training. To present that information to you, I'll introduce Maj. Tony Inzana, the third member of our ACM Development Team. He is a pilot in the 312th MAS and a pilot for Western Airlines. He is also one of our primary seminar

leaders.

MAJ. INZANA: One of the tasks of this workshop is to help answer the question, "Is cockpit or aircrew resource management training effective?" Do we know? If not, how do we find out? I wish it were as simple asking for, "the envelope please?" However, with help and sincere thanks to Drs. Foushee, Kanki, Helmreich, and Wilhelm, who have flown with us, attended seminars with us, and provided an invaluable sounding-board for us, we can shed some light on this question. We can show that a seminar-based aircrew resource management program when carefully crafted and supported by videotaped role-play, can change attitudes positively on the flight deck.

The findings help to verify our approach to the training, and the information obtained allows the administrator to tailor his presentation to meet the needs and unique requirements of our student population. It gives him the ability to design the program for the people, as opposed to trying to fit the people into the program.

We surveyed over 250 crew members in an effort to: 1) establish the first data base applicable to military air crews on the effectiveness of aircrew resource management training; and 2) to improve our implementation of that program. We enjoyed a 90% response rate to our survey. The results indicate that the students developed a highly receptive and improving attitude toward the seminar format in the areas that we selected for emphasis. However, student receptivity does not necessarily validate a concept of training or courseware content. Just because a student is in favor of a course, or its format or mode of presentation, does not necessarily mean that it is effective as an educational or learning process. But, the survey, which gathered personality and attitudinal data from our pilots prior to undergoing formal resource management training, suggests that some positive change is occurring.

To those who had had such training, we asked questions with respect to their own opinions of the value of the training they had experienced. For those who had not had such training, we asked questions in two key areas. First, we wanted to know if they had heard of CRM training either in the military or civilian world. Approximately 90% of those who had not had such training were aware of it. Eighty percent of crewmembers who had not had CRM training felt that it would be of benefit to them personally. Seventy-five percent of our respondents had flown with someone who had undergone CRM training and felt that those individuals demonstrated recognizable behavioral changes.

Finally, we asked if crew coordination had been improved as a result of aircrew resource management training, and 80% of those untrained individuals felt they had observed better coordination and flightdeck atmosphere from those crewmembers who had undergone training. We feel these results are fascinating and suggest that improvement is underway as a result of this type of training. For example, in a videotaped role play in a recent seminar, a crusty 20+ year pilot was faced with three bad choices. He was unable to solve his in-flight dilemma himself, and you should have seen the impact on the pilot's face (on video replay) when the solution was provided by the junior loadmaster (physically removed from the flight deck by 100 feet). The visual relief that slowly surfaced on that screen for all who were present was unquestionably real and was seen by all who were present.

Ladies and gentlemen, resource management training works. Thank you.

DISCUSSION

CAPT. CARROLL: If I understood correctly, you made a reference to a failed crewmember in this particular program being brought back or given additional exposure. Was my understanding correct? And if so, I'd be very interested in knowing how you recognized the deficiency, how you brought it to their attention, and what action was taken.

MAJ. HALLIDAY: This individual's problem was seen on an annual flight evaluation. He does have a problem, a known problem in the area of aircrew resource management. We think that we now have the tools to pick that up. He failed his flight evaluation not for lack of technical skills, but for inadequate resource management skills. He had already been a Phase I resource management graduate, but I guess it did not take. He was one of our worst students. We since re-entered him into our program in an effort to help him, but I think that it was an experiment that so far has had only limited results. I think he is a case of the problem crewmember that was raised yesterday, and that we perhaps need a far more powerful vehicle than a seminar to solve such a person's personal problems. Does that answer your question?

CAPT. CARROLL: Yes, but may I take it a little bit further? Because, I am going to be chairing a group that is going to be asking about how you can assess the effectiveness of training and so on. So I think this input is going to help us. Was there an assessment or a recognition at the time of this individual's problem that the rest of the crew had made an effort to help or support or obviate his concerns or problems? In the past, the question has been raised in the civilian environment: Can a whole crew fail a proficiency check when perhaps it's the primary problem of one individual's technical competence? I would like to extend this now into the area of resource management. Was the crew effective in trying to work with that individual?

LT. COL. BIEGALSKI: Ed, I share your concerns on this topic. To address that question the best I can say is there are no real guidelines to follow in this area that we have been able to find. We had a presentation on retraining the recalcitrant crewmember yesterday, and I spoke to that presenter, but was unable to get much more of a resolution to the problem than we already had. What we are attempting to do is not only deal with individual crewmembers who fail a checkride for resource management reasons, but we are also looking at flight crews who will come back periodically and report anecdotally that such and such happened, and that they could have done a better job. Or maybe they thought they did a good job, but we feel that they could have done a better job. What we attempt to do is to reform the crew, discuss the whole thing, rehash the situation in resource management terms and analyze it--hoping for a degree of success. We hope this success will be realized in terms of individuals' recognition of failures and their dedicated intent to try to go out and do better. We have had limited success. I will use myself as an example. I am a particularly hard-sell on that. I have a tendency to think with a single-seat mentality. It is a constant battle on my part to overcome that. I am not alone in this battle. Pilots

have a tendency to be individuals. In an attempt to get other crewmembers to be more promoting and sharing of information and to be more receptive, we find that they sometimes say, "Golly you're right, I screwed up--I'm going to do better next time." That doesn't mean that they will, but we have at least successfully provided recognition and motivation to improve.